Trace Evidence Unit
Evidence Processing Procedures

1 Scope

1.1 This document describes procedures used by personnel within the Trace Evidence Unit for the processing of physical evidence for trace evidence. This includes the Hairs and Fibers, Geology, and Anthropology disciplines.

1.2 The nature and extent of processing will be determined by the type of evidence submitted, by previous handling or examinations of the evidence, and by the requested examinations of the contributor.

1.3 Guidelines for the microscopic analyses and comparison of hairs, textile fibers, anthropological, and geologically-derived materials can be found in the discipline's specific protocols.

2 Equipment/Materials/Reagents

- Stereobinocular microscope, magnification range from approximately 2x to 40x
- Permount mounting medium
- Xylene substitute, Xyless or Xylene
- Cargille liquids or equivalent
- Glass microscope slides and coverslips
- Kraft paper
- Pillboxes
- Forceps
- Spatula
- Scissors
- Probes
- un-du®
- Disposable lab outerwear
- Cavicide or equivalent cleaning solution
- Lint free wipe
- Paper, various sizes
- Rock hammer
- Mortar/pestle
- KPac or equivalent
- Glassine envelopes
- Lux-o-lamp

- Alternate Light Source
- Adjustable rack
- Blotter paper
- Single-use vacuum filters
- Vacuum
- Laboratory coats
- Gloves

3 Standards and Controls

Not applicable.

4 Sampling

Due to the condition of the submitted items and the number of hairs and/or fibers present, a single sample selection scheme cannot account for all possible scenarios. As a result, Examiner and/or Physical Scientist discretion will determine a representative sample on a case-by-case basis when all hairs and/or fibers are not mounted. A representative sample is a selection of hairs and/or fibers that captures the varying characteristics of the total hairs and/or fibers collected from an item of evidence.

For a known fiber sample selection, the representative sample will represent the range of colors and fiber types comprising the item.

5 Procedures

When items of evidence that are received in the TEU Hair and Fiber Group and listed on the assigned case record will not require examinations, the Examiner will document this decision in the Case Record Communication Log.

For cases containing more than one item of evidence, prior to processing any items of evidence that require the use of a processing room(s), a processing plan will be documented in the Case Record Communication Log by the TEU personnel who will be processing the evidence. This processing plan will be reviewed by any qualified TEU personnel prior to the start of processing. The review will be documented in the Case Record Communication Log.

5.1 Processing Physical Evidence

5.1.1 Before evidence is processed, the processing area and all utensils (*e.g.*, forceps and scissors) will be cleaned using at a minimum, a cleaner such as Cavicide and a lint free wipe.

5.1.2 Gloves, at a minimum, will be changed between cases. Other PPE will be changed as necessary. Facemasks will be worn during the processing of items/cases that have potential for DNA analysis.

5.1.3 All evidence will be processed over clean paper that is placed on the surface of the table.

5.1.3.1 A clean sheet of paper will be used for the processing of each item of physical evidence unless case circumstances indicate otherwise. Items received in the same packaging may be processed on the same piece of paper.

5.1.4 Accessory lighting, special lighting techniques, and magnification may be used as needed.

5.1.5 The item of evidence will be described regarding type, color, size, and style, and carefully evaluated to determine its condition including damage, stains, etc. The item will be marked with the item number and initials of the processor when possible.

5.1.6 Additional items recovered during processing will be documented in the notes and may be subdivided; *e.g.,* Item 1 Pants becomes:

- Item 1 Pants
- Item 1-1 Belt from Item 1

5.1.7 Items of evidence that are scraped will be either hung on an adjustable rack above a table or manually handled, depending on the size of the item. Smaller items such as knives, sticks, gloves, etc. may be processed at a workstation using a lux-o-lamp or stereobinocular microscope. When processing items at a workstation or stereobinocular microscope, work surfaces will be cleaned using at a minimum a cleaner (*e.g.,* Cavicide, cleaning wipe). Any tools used for processing evidence will be cleaned prior to processing.

5.1.8 Visible debris can be picked off of the item and preserved in a separate pillbox. Soil that may be layered will be collected to preserve the layer structure. Layered soil can be either picked off an item and placed in a separate pillbox or a cutting of the item containing the soil can be collected and placed in a separate pillbox.

5.1.9 The adjustable rack to which the item is attached will be adjusted to allow the item to hang just above the surface of the table.

5.1.10 The item will be gently scraped to remove trace evidence that is adhering to the surface of the item. As the case warrants, debris may also be recovered by vacuuming the object and collecting the debris on a vacuum filter, or by taking tape and patting it across the surface of an item.

5.1.11 Debris removed from the inside of items may be separated from outside debris, as warranted by the circumstances of the case.

5.1.12 When processing shoes for glass, after scraping the items, the soles of the shoes will be examined for the presence of embedded glass.

5.1.12.1 The soles of the shoes will be assessed for cuts or tears.

5.1.12.2 Insert a metal probe into the cut or tear. If any solid objects are embedded in the cut or tear, gently pry the object out, and place it in a separate pillbox.

5.1.13 Items recovered from pockets of submitted clothing may be placed in a separate packaging and appropriately marked with laboratory number, item number and the processor's initials.

5.1.14 Debris removed from an item may be either collected in a pillbox or other suitable container, or directly mounted on a glass microscope slide following the procedures outlined below. The receptacle will be appropriately marked with the Laboratory number, item number and initials of the processor. Pillboxes generated from evidence from different locations (e.g., Victim, Subject or Crime Scene) will be placed in separate bags.

5.1.14.1 When processing items for hairs and/or fibers within a rated fume hood, recovered debris will be covered or placed on an adhesive pad while further processing continues to prevent loss.

5.1.15 If necessary, a known sample of fabric will be removed and placed in a druggist fold, appropriately marked with the Laboratory number, item number and initials of the processor. If necessary, the location of the sample site will be documented via diagrams, descriptions or other equivalent means in the case notes.

5.1.16 When the item of evidence has been processed, it will be returned to its original container and sealed. If the original container is replaced or damaged, a new one will be furnished, indicated in case notes and the original packaging will be retained within new packaging if possible.

5.1.17 After all items have been processed, they will be properly stored in a secure evidence cabinet, refrigerator, safe or bulky evidence room.

5.1.18 All evidence packages and/or boxes stored in any cabinet, refrigerator, safe or bulky storage that is not under active examination must be under proper seal. The Laboratory number should be clearly visible.

5.2 Procedures to be Used When Evidence Processing Includes Scraping Items Submitted from a Combination of Suspect(s), Victim(s), and Crime Scene(s)

5.2.1 To protect against cross-transfer and contamination during scraping, items submitted from the victim(s) and items submitted from the subject(s) will be processed in a different room or on a different date. The processing room used will be documented in the case notes. If items are processed at an individual's workspace directly, the area will be thoroughly cleaned between victim, suspect and crime scene items.

5.2.2 A clean laboratory coat and protective gloves will be worn prior to entering the processing room.

5.2.3 The processing room will be thoroughly cleaned according to steps described in TEU Evidence Processing Procedure, sections 5.1.1 and 5.1.2.

5.2.4 When the processing of items from the victim is complete, the technician will remove their laboratory coat and discard protective gloves.

5.2.5 A clean laboratory coat and new protective gloves will be worn prior to entering the second processing room.

5.2.6 The processing room will be thoroughly cleaned according to steps described in TEU Evidence Processing Procedure, sections 5.1.1 and 5.1.2.

5.2.7 Clean utensils will be used to remove debris from items and for taking known fabric samples.

5.2.8 Items submitted from the crime scene may or may not be processed in the same room(s) as the victim/subject, depending on the circumstances of the case. Clean utensils and examination paper will be used in either case.

5.2.9 No specific order is required in processing of victim, subject, and crime scene items.

5.3 Debris Screening and Slide Preparation - Hairs

5.3.1 The screening of the evidentiary item or recovered debris is facilitated by the use of lux-o-lamp magnifiers and/or stereobinocular microscopes. This debris will be examined for the presence of hair evidence.

5.3.2 When a large number of hairs are present in the debris, a representative sample of hairs of different ancestral characteristics, body area, length, color, texture and thickness may be mounted. The number of hairs mounted on glass microscope slides may be influenced by the types of hairs in the questioned debris and the circumstances of the case. The letters "R/S" are placed on the glass microscope slide and included in the case notes to indicate that a

representative sample of hairs was mounted and that additional hairs are present on or in the item/pillboxes.

5.3.2.1 If a representative sample of hairs from the questioned item(s) has been mounted on glass microscope slides, a targeted search of the questioned item(s) or recovered debris will be conducted if the following criteria are met:

- No hair association was found.
- A known hair sample(s) has been submitted from an individual(s) unrelated to the identified source of the questioned item(s) (*e.g.,* known hairs from victim, questioned items from suspect).

5.3.3 The screening of the debris can be directed by a "target" search, *e.g.,* searching for certain types of hairs (apparent head or pubic hairs) or searching for hairs that are similar to hairs comprising a known hair sample, when available.

5.3.4 When mounting several hairs of different lengths on a single slide, the length of the longest hair will be recorded on the frosted end of the glass microscope slide.

5.3.5 Hairs will be mounted on a clean glass microscope slide using a suitable mounting medium, *e.g.,* Permount. Each slide will contain the Laboratory number, the item number, and the initials of the individual preparing the slide.

5.3.6 Placing a thin film of solvent (such as Xylene substitute) on the surface of the slide will allow hairs to adhere temporarily until the mounting medium is applied. Using clean forceps, hairs will be placed on the slide and arranged so they can be completely covered by the glass coverslip.

5.3.7 Excess solvent will be blotted off to avoid run-off of the excess solvent when the mounting medium is applied and to help arrange hairs on the glass microscope slide. The used blotter paper will be discarded in the appropriate receptacle (see FBI Laboratory Safety Manual) between slides.

5.3.8 Forceps will be carefully cleaned between different items/pillboxes.

5.4 Debris Screening and Slide Preparation - Fibers

5.4.1 The screening of evidentiary items or recovered debris is facilitated by the use of lux-o-lamp magnifiers and stereobinocular microscopes. This debris will be examined for the presence of fiber evidence.

5.4.2 When the number of fibers present in the debris is such that all of the fibers cannot reasonably be mounted on a glass microscope slide, a representative sample of fibers of different colors, shapes and sizes may be mounted. The number of glass microscope slides prepared during the initial screening is dependent on the number and types of fibers in the questioned

debris and the circumstances of the case. The letters "R/S" are placed on the glass microscope slide and included in the case notes to indicate that a representative sample of fibers was mounted and that additional fibers are present in the item/pillbox.

5.4.3 The screening of the debris can also be directed by a "target" search, *i.e.,* looking for fibers that are similar to fibers comprising a known fiber sample, when available. The known fiber sample may include carpet samples and/or fabric samples either submitted separately or collected during the processing of clothing items.

5.4.4 Fibers will be mounted on a clean glass microscope slide using a suitable mounting medium, *e.g.,* Permount. Each slide will contain the Laboratory number, the item number, and the initials of the individual preparing the slide.

5.4.5 Placing a thin film of solvent (such as Xylene substitute) on the surface of the slide will allow fiber samples to adhere temporarily until the mounting medium is applied. Using clean forceps, fibers will be placed on the slide and arranged so they can be completely covered by the glass coverslip.

5.4.6 Excess solvent will be blotted off to avoid run-off of the excess solvent when the mounting medium is applied and to help arrange fibers on the glass microscope slide. The used blotter paper will be discarded in the appropriate receptacle (see FBI Laboratory Safety Manual) between slides.

5.4.7 Forceps will be carefully cleaned between different items/pillboxes.

5.4.8 When complete yarns are identified in the pillbox debris, they will be characterized (*e.g.,* diameter, twist, construction) before being separated and mounted on the glass microscope slide. Consideration will also be given to physically matching yarns to damaged fabric before mounting fiber samples from the yarn on a slide.

5.5 Selection and Preparation of Known Fiber Slides

5.5.1 A known sample will be selected that represents the range of colors and fiber types comprising the textile.

5.5.2 If possible, known yarn samples will not be taken from damaged areas because of potential future yarn/fabric matches.

5.5.3 Fiber samples from yarn types present in the fabric will be mounted. Warp yarns and fill yarns may be separately mounted. Sewing thread and button thread fiber samples may also be mounted.

5.5.4 In addition to the Laboratory number, item number and the initials of the processor, the letters "kn", which indicates a known sample, will be written on the frosted end of the glass microscope slide.

5.6 Debris Screening and Sample Preparation – Geologically-Derived Materials

5.6.1 Items are air-dried, if needed.

5.6.2 Individual components are removed from the items for identification as necessary. These individual sub-samples may not be representative of the entire item. Sub-samples are chosen based on the need to identify a particular component by a specific technique, and by its availability or presence in an item.

5.6.2.2 Items may be mechanically broken to facilitate sub-sampling.

5.6.3 Soil removed from objects, *e.g.,* shoes, will be kept as coherent as possible.

5.7 Debris Screening and Sample Preparation – Glass

The screening of evidentiary items or recovered debris is facilitated by the use of lux-o-lamp magnifiers and stereobinocular microscopes. This debris will be examined for the presence of glass evidence. As needed, refer to the *Forensic Glass Examinations, Section 4*; *Refractive Index of Glass by GRIM*, Section 4; *Elemental Analysis of Glass by Inductively Coupled Plasma – Optical Emission Spectrometry (ICP-OES),* Section 4; *Laboratory Annealing of Glass*, Section 4.2; and *Elemental Analysis by Laser Ablation Inductively Coupled Plasma – Mass Spectrometry (LA-ICP-MS),* Section 4 procedures for sample preparation and sampling guidance for each analysis technique.

5.8 Envelope/Letter Processing

5.8.1 When envelopes/letters containing stamps or labels are received in the TEU, an attempt shall be made to remove the stamps or labels using a suitable solvent such as un-du®.

5.8.2 If the stamp or label cannot be removed using a suitable solvent, no further attempt will be made to remove the stamp or label.

5.8.3 If the stamp or label can be removed using a suitable solvent, the underside shall be examined for the presence of trace evidence. If trace evidence is identified, it shall be handled as described previously.

5.8.3.1 Each stamp or label that is removed shall be, subdivided and identified; *e.g.,* Item 1 Envelope becomes:

- Item 1 Envelope
- Item 1-1 Stamp from Item 1
- Item 1-2 Label from Item 1

5.8.3.2 Each stamp or label that is removed shall be placed on a suitable clear plastic sheeting.

5.9 Adhesive Surfaces

Items of evidence may contain adhesive surfaces that require other units within the laboratory to examine them prior to removal. If adhesive surfaces are observed and any affected unit(s) is already on the examination plan to examine the item(s), the affected unit will be contacted. This contact is to determine how far the trace evidence examination process can proceed without interfering with the examinations of the affected unit(s) examinations. This communication will be recorded in the case communication log. If the affected unit(s) is not on the examination plan, then the examiner or scientist will follow the appropriate Laboratory Operations Manual practice and contact the appropriate individual(s) to determine if this examination(s) is necessary and requested. If the item(s) needs to be returned for additional trace evidence examinations, the examiner or scientist will mark the outer packaging of the item(s) to indicate that the item(s) needs to be returned for additional trace evidence examinations prior to the adhesive item(s) being removed.

6 Calculations

Not applicable.

7 Measurement Uncertainty

Not applicable.

8 Limitations

Not applicable.

9 Safety

9.1 While working with physical evidence, Laboratory personnel will wear appropriate protective attire (at a minimum, a laboratory coat and gloves).

9.2 Universal precautions will be followed.

9.3 No specific hazards are associated with the microscopic examination techniques performed.

9.4 Refer to the safety data sheet (SDS) for guidelines regarding the use of a specific chemical.

10 References

- FBI Laboratory Quality Assurance Manual.
- FBI Laboratory Operations Manual.
- FBI Laboratory Safety Manual.
- Trace Evidence Procedures Manual.

Rev. #	Issue Date	History
5	01/15/2021	Added Section 5.1.14.1 to address processing for hairs/fibers within a rated fume hood
6	05/03/2021	Changed category of testing to discipline and updated discipline names in Scope. Added LA-ICP-MS reference in 5.7.

Approval Redacted - Signatures on File

Trace Evidence Unit Chief: Date: 04/30/2021

Hairs and Fibers Technical Leader: Date: 04/30/2021

Geology Technical Leader: Date: 04/30/2021

Anthropology Technical Leader: Date: 04/30/2021